REMARKS

Regarding the status of the present application, Claims 1-5 have been amended, and Claims 1-5 are pending in this application. Reconsideration of this application is respectfully requested.

A minor error was uncovered in the Summary of the Invention section and has been corrected.

Claims 1-5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over US Patent No. 4,912,716 issued to Mead in view of US Patent No. 4,666,255 issued to Taylor et al. It is respectfully submitted that the Examiner's position is in error.

The Examiner's position is that "Mead shows in Fig. 3 a laser oscillator 13 and a microwave oscillator 18." The Examiner admitted that "Mead does not disclose a single sideband mixer." However, the Examiner indicated that "Taylor teach a single sideband mixer (modulator) (col. 1, 1.18-29) and it would have been obvious to one of ordinary skill to understand that a single sideband mixer must include the elements recited in claims 2 and 4 in order to function as a single sideband mixer. Therefore, for the benefit of outputting a single controlled frequency signal, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide Mead a single sideband mixer as taught by Taylor.

The Mead patent discloses a "microwave oscillator frequency modulates the output of the laser system to be controlled. The modulated output passes through a molecular gas cell. The output of the molecular gas cell is detected by a square law device, which produces a signal at the desired microwave frequency only when a sideband of the modulated laser output coincides with the desired molecular transition frequency. A quadrature signal pair is produced by mixing the filtered output of the square law device with two phase-shifted signals from the microwave oscillator. The dispersion signal can be used to control the output frequency of the laser system, since its magnitude and sign are uniquely related to the required direction of correction." [see Abstract]

The Taylor et al. patent discloses an "acousto-optic frequency shifter in which two cylindrical acoustic resonators driven 90° out of phase from one another are placed around a birefringent, single-mode optical fiber approximately three-quarters of a polarization beat length apart. The resonators interact with optical radiation propagating in one of two polarization modes of the fiber, the first to cross-couple two sidebands into the other polarization mode, and the second to suppress one of the sidebands in the cross-coupled mode and enhance the other, thereby creating a single sideband signal completely within the fiber." [see Abstract]

The present invention provides for a virtual coherent signal controlled laser oscillator for use in optical phase locked coherent receivers, and is intended for use in coherent optical transmitter and receiver systems.

Pending independent Claim 1 calls for

A virtually coherent signal controlled laser oscillator comprising:

a signal controlled laser oscillator that receives a fixed bias input signal and outputs an optical frequency signal $f_0 + f_m$;

a signal controlled microwave oscillator that receives a frequency control input signal and outputs a microwave frequency signal, f_m; and

a single sideband mixer that processes the signal output by the laser oscillator and microwave oscillator to output a single controlled optical frequency signal.

It is respectfully submitted that the laser 13 shown in Fig. 3 of the Mead patent does not receive a fixed bias input signal. In the Mead system, a "signed correction signal 48, which can be a dispersion signal, is representative of both any deviation between the desired frequency of the output beam 12 and the desired molecular transition frequency, and the direction of the deviation between the frequencies. An alternative embodiment is shown in FIG. 3, where a single mixer 34 is used. In this case the adjustable phase shifter 32 is adjusted so the desired dispersion signal is obtained from the mixer 34." [see column 5, lines 2-10] Therefore, it is clear that this signed correction signal 48 is not a fixed bias signal.

The output of the microwave oscillator 18 disclosed in the Mead patent is input to a frequency modulator 14 that frequency modulates the laser beam output by the laser 13. This microwave oscillator 18 is not a "signal controlled microwave oscillator" as is employed in the present invention. There are no frequency control input signals applied to the microwave oscillator 18 of the Mead system.

Furthermore, there is no single sideband mixer disclosed or suggested in the Mead patent, nor is there a single sideband mixer that receives inputs from a signal controlled laser oscillator and a signal controlled microwave oscillator. There is a mixer 34 used in the Mead system that mixes outputs of a high pass filter and a phase shifter that generates the signed correction signal 48.

In the portion of the Taylor et al. patent cited by the Examiner, and in particular, in the Background of the Invention section, it is stated that "The theory of single sideband (SSB) modulators is very well understood. They involve a carrier signal which has a frequency f_c, and the amplitude or phase of which is modulated by a modulating signal having a frequency f_m. The modulating signal typically carries the information which it is desired to transmit. Modulating the amplitude of the carrier signal with the modulating signal may be regarded as producing a new signal with a frequency spectrum having three discrete components one at the original carrier frequency f_c and the other two occurring spectrally symmetrically to either side of f_c at f_c-f_m and f_c+f_m."

This portion of the Taylor et al. patent relates to single sideband modulators, and there is no disclosure or suggestion in the Taylor et al. patent regarding single sideband mixing or

mixers. In fact, the term "mix" is not used in the Taylor et al. patent. It is respectfully submitted that a modulator is not a mixer as is suggested by the Examiner. Also, it is respectfully submitted that there is no teaching contained in the Taylor et al. patent regarding the use of either a signal controlled laser oscillator or a signal controlled microwave oscillator.

Furthermore, it is respectfully submitted that there is no express teaching contained in the respective patents that would suggest their combination, and certainly not to achieve a virtually coherent laser oscillator as is provided by the present invention. It is respectfully submitted that the Examiner has used hindsight reconstruction to reject the present invention, using the teachings of the cited patents in light of Applicant's own teachings.

It is respectfully submitted that there is no teaching or suggestion in either the Mead or Taylor et al. patents, taken singly or together, that would arrive at the invention recited in pending Claim 1. One skilled in the art would not substitute a single sideband mixer for the frequency modulator disclosed in the Mead patent, because it would make the system expressly disclosed in the Mead patent inoperable for its intended purpose. Therefore, any such substitution of a single sideband mixer for the frequency modulator disclosed in the Mead patent amounts to hindsight reconstruction.

Therefore, and in view of the above, and with regard to pending Claim 1, it is respectfully submitted that the Mead or Taylor et al. patents, taken singly or together, do not disclose or suggest a "virtually coherent signal controlled laser oscillator", "a signal controlled laser oscillator that receives a fixed bias input signal and outputs an optical frequency signal $f_0 + f_m$", "a signal controlled microwave oscillator that receives a frequency control input signal and outputs a microwave frequency signal, f_m", or "a single sideband mixer that processes the signal output by the laser oscillator and microwave oscillator to output a single controlled optical frequency signal", as is recited therein.

Therefore, it is respectfully submitted that the invention recited in Claim 1 is not disclosed or suggested by the Mead or Taylor et al. patents, taken singly or together,. Accordingly, withdrawal of the Examiner's rejection and allowance of Claim 1 are respectfully requested.

Independent Claim 4 is considered patentable for substantially the same reasons argued above with regard to Claim 1. Therefore, it is respectfully submitted that the invention recited in Claim 4 is not disclosed or suggested by the Mead or Taylor et al. patents, taken singly or together,. Accordingly, withdrawal of the Examiner's rejection and allowance of Claim 4 are respectfully requested.

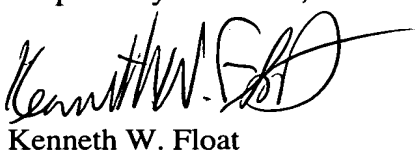
Dependent Claims 2, 3 and 5 are considered patentable based upon the allowability of Claims 1 and 4. Therefore, it is respectfully submitted that the invention recited in Claims 2, 3 and 5 are not disclosed or suggested by the Naka Mead or Taylor et al. patents, taken singly or

together,. Accordingly, withdrawal of the Examiner's rejection and allowance of Claims 2, 3 and 5 are respectfully requested.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure to the extent indicated by the Examiner.

In view of the above, it is respectfully submitted that all pending Claims are allowable over the art of record and that the present application is in condition for allowance. Reconsideration and allowance of this application are earnestly solicited.

Respectfully submitted,



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